THE GENERA BALDULUS AND DALBULUS IN NORTH AMERICA INCLUDING MEXICO. (HOMOPTERA: CICADELLIDAE).

By Dwight M. DeLong, Columbus, Ohio.

With constantly increasing knowledge of biological relationships it is becoming evident that many species of leafhoppers belonging to several genera are vectors of organisms which cause plant diseases. Certain species of *Baldulus* and allied genera are included in this group of vectors and one or more of the species which are being described at this time are apparently concerned with and may be important as vectors of organisms causing plant diseases on corn and other plants in Mexico.

The genus *Baldulus* was described by Oman[1] to include the genotype *montanus* Oman and *elimatus* (Ball). Also *maidis* (DeLong) was later placed in this genus. The genus is similar in venation to *Macrosteles*, *Balclutha* and *Cicadulina*. Oman states in his original description, "Face elongate, triangular, margin of genae slightly sinuate below the eyes. Vertex triangularly produced and rounding to the front, median length slightly less than length of pronotum. Head including eyes equal to pronotum in width. Elytra elongate and slender with two anteapical and four apical cells and distinct appendices. Wings with three apical cells."

The nine species which apparently belong to this general group and which are being treated at this time seem to represent two rather distinct groups which are here considered as *Baldulus* and a new genus *Dalbulus*. The genus *Baldulus* is represented by the type species *montanus* Oman and a closely related species described below as *bilineatus*, both of which have the long triangular vertex, almost as long as wide, which is conical in shape. The male aedeagus in both is elongate with a straight narrow shaft which is elbowed at the base so as to form a long narrow dorsal portion and the caudal tip bears rather long narrow apical processes. There are no pygofer spines and the ventral pygofer margin is not heavily scleritized. A third species, *tropicus*, which is represented by the female only is placed here as it resembles *bilineatus*.

Dalbulus n. gen.

This genus is represented by *elimatus* (Ball), *maidis* (DeL. & Wol) and four species being described at this time: *guevarai*, *longulus*,

[1] Proc. Ent. Soc. Wash. 36: 79. 1934.

gelbus and *acus*. The genus *Dalbulus* is characterized by species with bluntly rounded heads, scarcely angled and which are thick on their margins with the front. The vertex is decidedly wider than long. The male aedeagus is dorso-ventrally broadened with a long, laterally flattened baso-ventral portion which extends down between the styles. There is no dorsal basal portion and the apical processes are formed by notched or sloping portions of the apical part of the aedeagus shaft. The basal margin of the pygofer on each side is heavily scleritized and appears as a broad spine-like process which extends beyond the remainder of the pygofer at the apex and the caudal margin of the pygofer slopes ventrally and caudally to the spine-like portion. A pair of forcep-like caudal spines are located on the dorso-caudal margin of the pygofer. The female seventh sternite is produced and very strongly produced and spatulate in the typical species.

Type of genus: *Deltocephalus elimatus* Ball.

The types of all the new species described below are in the author's collection unless otherwise designated.

Key to Genera

1. Vertex angled, about as long as median width at base between the eyes, color pattern on vertex and pronotum longitudinal in type, spots triangular; male aedeagus elongate, narrow, upturned at base and with apical processes caudally. Female seventh sternite emarginate ..... *Baldulus*

   Vertex produced and rounded or blunt at apex, distinctly wider between eyes at base than median length; paired spots on vertex rounded or broadened. Male aedeagus not upturned at base. Female seventh sternite produced and truncate, notched or spatulate ..... *Dalbulus*

Key to Species of *Baldulus*

1. Female seventh sternite broadly excavated with a small sunken tooth at middle; male unknown. (Known from Mexico only) ..... *tropicus*

   Female seventh sternite almost truncate without median tooth 2

2. One pair of apical processes of male aedeagus forked near base; female segment truncate—occurs in mountains of Arizona. *montanus*

   Neither pair of apical processes of male aedeagus forked; female segment broadly, shallowly excavated on median half. (Known only from Mexico) ..... *bilineatus*

Key to Species of *Dalbulus*

1. Male aedeagus with three terminal processes separated near base, a shorter ventral process and two lateral dorsal processes. Styles narrow elongate. Female sternite produced and truncate apically ..... *acus*
   Male aedeagus composed of one piece. Styles shorter and broader at base. Female sternite not truncate at apex .. 2
2. Aedeagus deeply notched or excavated at apex to form apical processes. Female sternite produced and spatulate ... 3
   Aedeagus not deeply notched, sloping to ventral apex. Female sternite not spatulate 5
3. Aedeagus notch forming a broad, dorsal truncated portion, filamentous apical portion single. Female sternite with a long, narrow, tapered spatulate posterior margin ..... *elimatus*
   Aedeagus notch forming a caudo-dorsal thumb-like process; filamentous apical portion composed of two processes on each side. Female sternite more broadened and rounded near base 4
4. Notch deep, thumb-like process long. Female sternite with a long and broad spatulate-like posterior margin ... *guevarai*
   Notch more shallow, thumb-like process short, more rounded. Female sternite broad and short, produced posterior margin bluntly pointed ..... *longulus*
5. Aedeagus rather narrow in lateral view with a median dorsally produced process. In ventral view with two divergent processes at apex. Female sternite with posterior margin produced and narrowly, rather shallowly excavated at middle ..... *maidis*
   Aedeagus in lateral view broadened at base and again just before apex. Apex with an inner pair of short teeth and an outer pair of longer spines (ventral view). Female not known ..... *gelbus*

Baldulus montanus Oman

Baldulus montanus Oman. Proc. Ent. Soc. Wash. 36: 79, 1934.

A small species with a bluntly pointed apex and marked with black elongate spots. Length 3.25 to 3.5 mm.

Vertex as long or slightly longer than basal width between eyes, produced, bluntly pointed and conical.

Color: Pale yellow; vertex with a small brownish spot at apex, a large black triangular spot above and a little anterior to each

ocellus, a brownish quadrangular spot on the posterior margin next each eye and a faint brownish pair between these. Pronotum and scutellum with a rather broad, median, creamy stripe on each side of which are longitudinal brownish vittae. Veins of elytra and commissural line to apex of clavus white, cells embrowned.

Genitalia: Female seventh sternite with the posterior margin truncate or slightly sinuate. Male plates triangular; the apices forming narrow projecting and diverging processes. Aedeagus with shaft long and with a long basal portion bent dorsally and caudally. Apex curved upward with two pairs of processes at tip. One pair is long, slender and extending anteriorly along the shaft. The other pair is forked near the base, curved upwardly then anteriorly. The posterior branch is short; the anterior fork is longer.

This species was described from the Santa Rita Mts., Arizona, and has not been reported for other states.

Baldulus bilineatus n. sp.

Resembling *montanus* in form, appearance, coloration and type of male genitalia, but specifically distinct. Length 4 mm.

Vertex produced and conically pointed, almost as long at middle as basal width between the eyes.

Color: Pale brownish with a broad, white longitudinal stripe extending from the apex of the vertex to the apex of the scutellum. There is an elongate triangular black spot on either side at apex of vertex and a small elongate black spot on inner margin of each eye. Pronotum with elongate brown lines and stripes, the outer portions paler. Elytra pale brownish, veins pale. Dark fuscous areas in base or apex of cells on the disc. Face brownish with a pair of transverse dark marks just beneath margin, a round black spot just anterior to each eye and a series of dark arcs on lower portion of face.

Genitalia: Female seventh sternite almost truncate with indication of two median blunt teeth separated by a notch. The male aedeagus is curved, in lateral view, with a long dorsally directed basal portion and with four apical processes. The two ventral processes are longer and are bent anteriorly and ventrally. The styles are rather short, broadened at base and narrowed at apex to form a curved spine which is pointed apically and curves outwardly. The plates are short, decidedly exceeded in length by the pygofers.

Holotype male and paratype males from Zitacuaro, Mich., Mexico, October 5, 1941, collected by Plummer, Good, Caldwell and

DeLong. Paratype males from Carapan, Mich., October 2, 1941 by the same collectors. Allotype female and male paratypes taken at Laguna de Zempoala, Mor., October 21, 1945 by Plummer, DeLong, Hershberger and Elliott. Male paratype from Rio Frio, D. F., October 10, 1945 and from Desierto de Los Leones, D. F., Mexico, October 9, 1945 collected by DeLong, Hershberger and Elliott. Paratype male from Cuernavaca, Mor., October 21, 1941 by DeLong, Good, Caldwell and Plummer.

Baldulus tropicus n. sp.

Resembling *bilineatus* in general appearance but with a blunter head, color marking different and with different female seventh sternite. Length, female 4.5 mm.

Vertex produced and bluntly angled, a little wider between eyes at base than median length. Pronotum about one and one-half times as long as vertex.

Color: Vertex, pronotum and scutellum pale brownish with a broad white longitudinal stripe extending from apex of vertex to apex of scutellum. Vertex with a large round black spot each side of white stripe and just above margin. A black quadrate spot along each eye at base. Pronotum with indications of longitudinal darker brown stripes on each side of white stripe. Elytra pale brownish subhyaline, unmarked, veins white. Face and beneath pale yellow. Female seventh sternite black margined on median portion of posterior margin.

Genitalia: Female seventh sternite with well produced lateral angles between which the posterior margin is distinctly but rather shallowly excavated to form a median small sunken tooth.

Holotype female collected at Tamazunchale, S. L. P., Mexico, November 2, 1945, from the herbaceous growth in a tropical wooded area by DeLong, Hershberger and Elliott. This species is described from a single female specimen as it seems to represent a tropical species of this group. The other Mexican species belonging to this genus and described at this time as *bilineatus* has not been taken at elevations below 6,000 feet and for the most part at elevations of 9,000 to 10,000 feet. They occur in forests of pine or fir. The species here designated as *tropicus* was taken at 500 feet elevation in the tropical deciduous forest.

Dalbulus climatus (Ball)

Deltocephalus climatus Ball. Can. Ent. 32: 345. 1900.

A blunt headed brownish species with two large black spots on anterior portion of vertex. Length 4 mm.

Vertex bluntly produced, scarcely angled, almost twice as wide between eyes at base as median length.

Color: Dull yellow with faint or heavy brownish longitudinal vittae on vertex and pronotum. Vertex with a large ovate black spot on each side just above margin and next the eye. There is a small fuscous spot at apex. Elytra appearing pale brownish with pale veins. Face pale brownish, a small black spot just beneath each ocellus.

Genitalia: Female seventh sternite narrowed near base, then convexly rounded and produced as a bluntly rounded spatulate process extending more than half the length of the pygofer. Male plates long, tapered, with acutely pointed apices, extending decidedly beyond the pygofer. The aedeagus is rather broad with a basal broad leaf-like process on ventral side extending between the apices of the styles. The apex is tapered to form a long, slender, sharply pointed process which is separated from a median dorsal, broadly truncated portion by a deeply rounded notch.

This species was described from specimens from Mexico. It is an abundant species in many regions of Mexico. Specimens at hand are from San Jacinto, D. F., Mexico, September and October, 1933, Tlalpan, D. F., September 16, 1923, Xochimilco, D. F., September 20, 1923 and Mexico City, September 20, 1923—all collected by A. Dampf. Guadalajara, Jalisco, Mexico; Santa Rosa, Pue., July 23, 1927 (Dampf); Zitacuara, Mich., September 29, 1941; Uruapan, Mich., October 1, 1941; Zacapu, Mich., October 4, 1941; Tuxpan, Mich., October 5, 1941; Rio Frio, D. F., October 7, 1941; Pueblo, Pue., October 18, 1941; La Guarda, D. F., October 26, 1941 and Tehuacan, Pue., October 17, 1941—all collected by Good, Caldwell, Plummer and DeLong.

Dalbulus guevarai n. sp.

Resembling *elimatus* in form and general appearance but with distinct male genitalia. Length 4 mm.

Vertex blunt and rounded, about one-third wider between eyes at base than median length.

Color: Pale yellowish, vertex with a pair of black spots just above margin of vertex, one next either eye. Elytra whitish subhyaline.

Genitalia: Female seventh sternite rather broad at base, gradually roundingly produced and tapered to form a blunt apex at about

one-third the length of the pygofer. Male aedeagus with a broad flattened anterio-ventral portion which extends down between the styles. The apical portion is composed of a thumb-like dorsal process and a long, slender, curved finger-like ventral process which extends caudally and curves dorsally at apex. A short finger-like process arises just ventrally at the base of the long ventral process. The styles are short with apex truncate, the outer margin extending laterally. The plates are long and narrow entending to apex of pygofer. The ventral margin of the pygofer is heavily sclerotized and curled under and extends to the apex.

Holotype male, allotype female and male and female paratypes collected at Iguala, Gro., Mexico, September 11, 1939, by DeLong and Plummer and October 22, 1941, by Good and DeLong. Paratypes are also at hand from Navajoa, Son., Mexico, July 16, 1927 (Dampf) and Taxco, Gro., October 24, 1941, by Caldwell, Good DeLong and Plummer. Holotype, allotype and paratypes in the author's collection; paratypes in the U. S. National Museum collection.

I take pleasure in naming this species for Mr. Jose Guevara whose studies have helped to increase our knowledge of the leafhopper fauna of Mexico.

Dalbulus longulus n. sp.

Resembling *maidis* in form and coloration but with distinct genitalia. Length 3.5 mm.

Vertex short, broad, rounded, almost three-fourths as long at middle as basal width between the eyes.

Color: Pale yellowish with a pair of black spots above margin, one next each eye. Pronotum slightly darker; elytra whitish subhyaline.

Genitalia: Male plates elongate, pointed, almost as long as pygofer. Aedeagus broadened at base in lateral view by a broad, flat process which extends ventrally between the apices of the styles. Apical portion with a short, blunt thumb-like process dorsally and a pair of elongate, slender ventral processes on each side. The dorsal process is twice as long as the ventral process and curves dorsally. The pygofer is thickened at the base and curled so as to appear as a separate process.

Holotype male and paratype males collected at Tamazunchale, S. L. P., Mexico, September 20, 1945 by DeLong, Hershberger and Elliott. Paratype males, same locality, August 29, 1939 by F. M. and D. M. DeLong. Female allotype and male and female paratypes from Tamazunchale, September 25, 1941 and male and

female paratypes from Valles, S. L. P., September 24, 1941 collected by DeLong, Caldwell and Good.

Dalbulus acus n. sp.

Resembling *elimatus* in coloration and general appearance but with distinct male genitalia. Length 5 mm.

Vertex produced, blunt at apex, a little wider between eyes at base than median length.

Color: Pale brownish with apex white and longitudinal white stripe extending from apex of vertex to apex of scutellum. There is a minute black spot at apex and a larger black spot each side between apex and eyes just above margin. The outer portion of the pronotum is paler, thus giving the appearance of a rather broad brownish stripe extending from the large spots on vertex to the basal angles of scutellum. Elytra pale brownish with paler veins, appearing striped longitudinally. Face pale brownish.

Genitalia: Female seventh sternite broadly, shallowly excavated on posterior margin. Male aedeagus composed of three slender apical processes. The central process is more slender, shorter and more ventral in position than the two dorsal processes which are broadened, in lateral view, just before the pointed apex. The styles are long, rather narrow, the apex forming an outwardly curved spine. The aedeagus connective is about two-thirds as long as the aedeagus. The plates are three-fourths as long as the pygofers.

Holotype male, Mexico City, D. F., September 18, 1939, collected by D. M. LeLong. The allotype female was collected near Mexico City in February, 1933, by A. Dampf.

Dalbulus maidis (DeLong & Wolcott)

Cicadula maidis DeLong & Wolcott. Jour. Dept. of Agr., Porto Rico 7: 265, 1923.

A pale, blunt-headed species with two separated black spots on anterior portion of vertex. Length 4 mm.

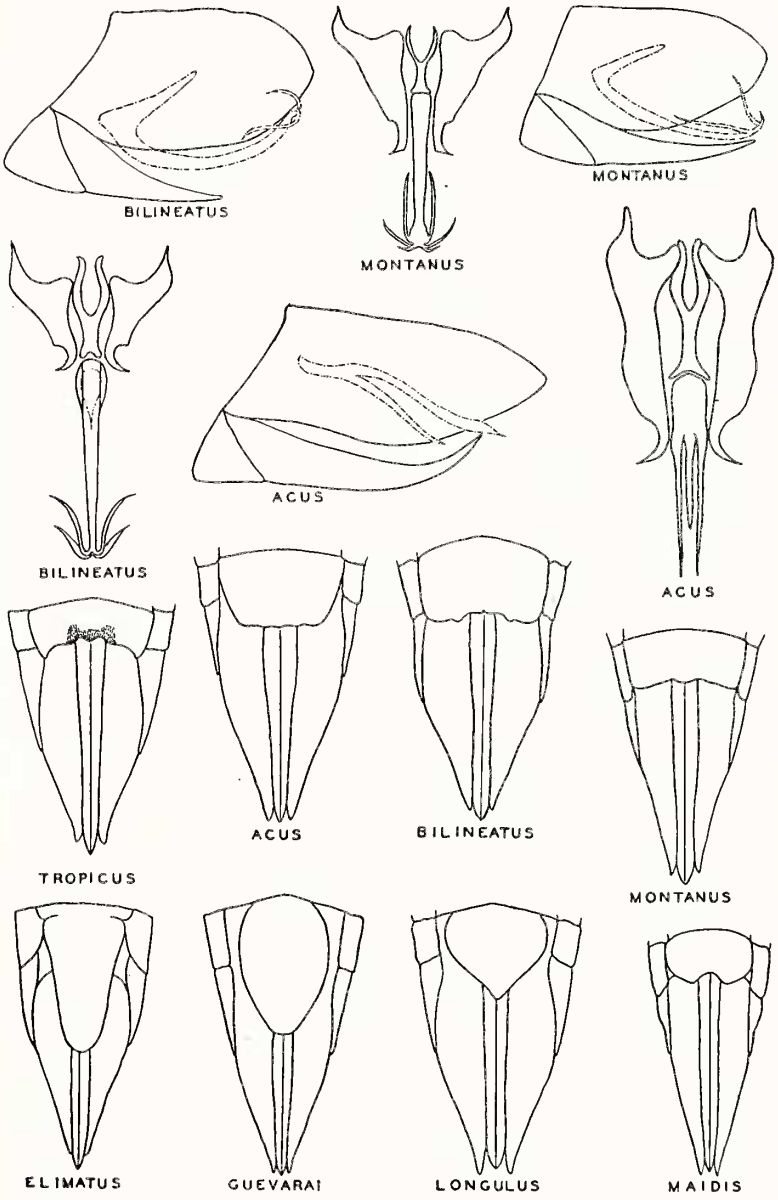
Vertex rather broadly, roundedly produced, about one-third wider between eyes than median length.

Explanation of Plate III

Above—lateral and ventral views of male genital structures for *B. bilineatus, B. montanus,* and *D. acus.*

Below—ventral views, tip of abdomens of females showing seventh sternite and produced posterior margin.

BULL. B. E. S. VOL. XLV PLATE III



Color: Same shade of yellow or greenish yellow; vertex with a pair of large, round, black spots, one behind each ocellus and close to either eye. Elytra yellowish subhyaline; veins lighter.

Genitalia: Female seventh sternite with posterior margin slightly produced on either side of a broad, rather shallow, median V-shaped notch which is slightly embrowned. Male plates elongate, triangular with narrow, sharp-pointed apices about two-thirds as long as pygofers. The aedeagus is elongate and rather slender. The apex is composed of a pair of divergent processes which curve outwardly, caudally and are sharp-pointed at the apex. In lateral view the apical half is a little broader with apical spines extending anterioventrally and posterio-dorsally. A short, blunt, dorsal process occurs at the median curved portion.

Originally described from Puerto Rico this insect has been recorded from Arizona, California, Texas, Florida and North Carolina in the United States. It is also recorded from Peru, Argentina, Costa Rica, Cuba, Brazil, Venezuela and Mexico. In Mexico other related species have undoubtedly been identified as *maidis*. Records at hand from Mexico are from Iguala, Gro., September 11, 1939, Chilpancingo, Gro., October 25, 1941 collected by Good, Plummer and DeLong; Zincaura, Gro., September 2, 1930 by J. Parra; Esperanza, Chia., August 2, 1938, Huiztla, Chia., September 4, 1932 and Petocale, Q. Roo, August 21, 1925 collected by A. Dampf; San Rosa, Pue., July 23, 1927 by Dampf; Tamazunchale, September 25, 1941, Valles, S.L.P., September 25, 1941 and Saltilla, Coah., September 23, 1941 collected by DeLong, Caldwell and Good.

Dalbulus gelbus n. sp.

Resembling *maidis* in form, coloration and general appearance but with distinct male genitalia. Length 4 mm.

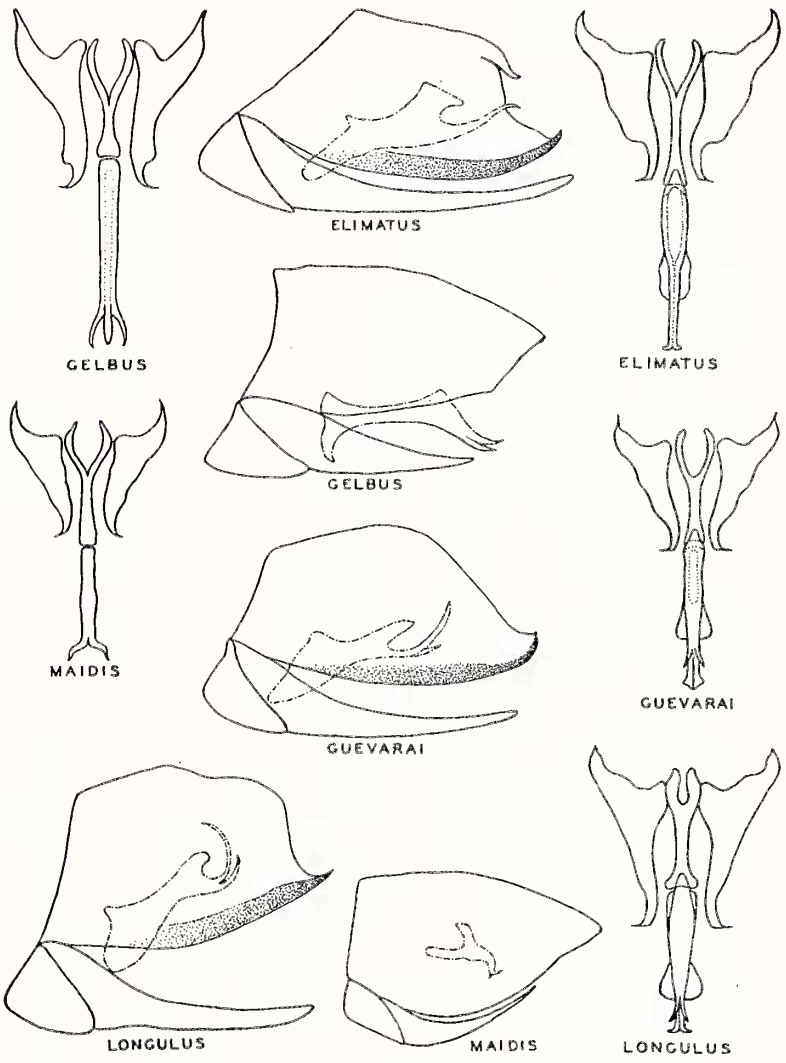
Vertex short, blunt, rounded, a little more than half as long at middle as basal width between the eyes.

Color: Pale yellow or cream with a pair of rather large black spots just back of margin on vertex, one rather close each eye. Elytra whitish subhyaline.

Explanation of Plate IV

Lateral and ventral views of male genitalia of species of *Dalbulus* as labeled.

BULL. B. E. S. VOL. XLV PLATE IV



Genitalia: The male plates are about two-thirds the length of the pygofer. The styles are elongate with narrow apices composed of pointed spine-like outwardly curved tips. The aedeagus in lateral view is broadened at the base. The apical portion is also broadened then sloping to a ventrally caudally pointed apex. In ventral view the apex is composed of a pair of short pointed median processes and a pair of outer longer slender divergent processes.

Holotype male and paratype males collected at Iguala, Gro., Mexico, September 11, 1939 by D. M. DeLong and C. C. Plummer. Male paratypes from Tepotzlan, Mor., Mexico, September 11, 1941 by Plummer, Good, Caldwell and DeLong.

Abnormality in Corydalus (Megaloptera). This note records an abnormality in the left mesothoracic leg of *Corydalus cornutus* (L). The legs of this species are of the normal type with five-segmented tarsi terminating in double claws. Measurements (in millimeters) of a normal and the abnormal leg are given below.

	Normal	Abnormal
Coxa	3.8	3.7
Trochanter	2.0	1.5
Femur	7.0	5.0
Tibia	7.0	4.0
Tarsus	7.0	3.2
	26.8	17.4

The abnormal leg is perfectly formed except for the fourth tarsal segment which is reduced to a small triangular protuberance, devoid of articular connections, fused to the inner half of the distal portion of the third segment. Functionally, the tarsus of the abnormal leg is four-segmented since the fifth segment articulates with the third.—George S. Tulloch, Merrick, New York.

Hippodamia convergens Guer. This ladybird beetle was found congregating in vast hordes along the Merced River near the west entrance of Yosemite National Park, California on June 16, 1950. At this particular place where I stopped I could have picked up gallons of these beetles which were in masses on large rocks, among sticks and leaves near the rocks, and on low shrubs. These were within 15 feet of the river's edge. The congregating of these beetles has aroused interest for some time. In North Carolina I had observed them on mountain tops, especially on top of Mt. Pisgah at about 5700 feet altitude, in 1930.—D. L. Wray, Raleigh, N. C.